The Early and Late Clinical Outcomes of Diabetic Patients with Acute Myocardial Infarction Treated by Primary Percutaneous Transluminal Coronary Angioplasty

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ZHAO ET AL.: ***The Early and Late Clinical Outcomes of Diabetic Patients with Acute Myocardial Infarction Treated by Primary Percutaneous Transluminal Coronary Angioplasty.*** *We study 339 patients with acute myocardial infarction (AMI) consecutively treated by primary angioplasty (P-PTCA) patients were divided into diabetes group (63 cases) and non-diabetes group (276 cases). The baseline clinical characteristics, coronary angiogram and major cardiovascular events (MACE) were analysed. No significant differences were observed in coronary artery lesions between the 2 groups. During early follow-up (within 1 month), in diabetes group, left ventricular ejection fraction (LVEF) was lower (0.54±0.10 vs 0.60±0.13, P<0.05), and incidence of non-fatal heart failure was higher (16.7% vs 7.1%, P<0.05) than in non-diabetes group, but cardiac death rate was similar (P>0.05). At late follow-up (mean 20.6±8.7 months), in diabetes group, the incidence of non-fatal heart failure and rate of target vessel revascularization increased (P<0.05, P<0.01, respectively), meanwhile incidence of MACE was higher (63.0% vs 32.7%, P<0.01) and survival rate freedom from MACE decreased (37.0% vs 67.3%, P<0.01) compared with those in non-diabetes group, but total cardiac mortality rates were similar in the 2 groups (7.4% vs 3.9%, P>0.05). Multivariate analysis indicated the presence of diabetes (RR 4.15, 95% CI:1.29-15.62) and the LVEF were associated with a higher incidence of MACE and they were independent risk factors respectively affecting MACE free survival. MACE free survival rate is lower in AMI patients with than not with diabetes treated by P-PTCA, but overall cardiac mortality rates are similar in the 2 groups, which suggest P-PTCA be more likely to improve the clinical benefit in terms of mortality rate, particularly in diabetes. (J HK Coll Cardiol 2001;9:166-170)*

Acute myocardial infarction, angioplasty, diabetes mellitus, transluminal, percutaneous coronary, prognosis

摘要

我們研究339例連續行直接PTCA的AMI患者分成糖尿病組（63例）與非糖尿病組（276例），分析兩組患者一般臨床特征及冠脈病變特點，並隨訪主要心血管事件（MACE）發生率。兩組間冠脈病變無顯著差異；與非糖尿病組比較，糖尿病組近期隨訪中(1月內)左室射血分數（LVEF）減低（0.54±0.10比0.60±0.13，P＜0.05），非致命性心力衰竭發生率增高（16.7%比7.1%，P＜0.05），但心臟性死亡率無顯著區別（P>0.05）；遠期隨訪(平均20.6±8.7月)，糖尿病組非致命性心力衰竭與靶血管血運重建率增高（P＜0.05，P＜0.01），MACE發生率增加（63.0%比32.7%,P＜0.01），且無MACE存活率降低（37.0%比67.3%, P＜0.01)，但兩組間總心臟性死亡率無明顯差異(7.4%比3.9%,P>0.05)；多變量分析顯示，糖尿病因素及LVEF與較高的MACE發生率密切相關，是影響無MACE存活率的獨立危險因素，（RR4.15，95%可信區間：1.29-15.62）。AMI伴或不伴糖尿病患者直接PTCA治療後前者無MACE存活率仍低於後者，但兩組間總心臟性死亡率無顯著差異，直接PTCA對伴有糖尿病這類高危患者在降低心臟性死亡率方面仍有一定優勢。

關鍵詞：急性心肌梗死　血管成形術　糖尿病　經腔　經皮冠狀動脈　預后

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Diabetes mellitus is one of the most important risk factors for development of coronary artery disease. Diabetic patients complicated with acute myocardial infarction (AMI) have higher incidence of reinfarction, left ventricular dysfunction and especially mortality than non-diabetic patients complicated with AMI.[1] Several reports have suggested that AMI patients with diabetes has a poor clinical results after intravenous thrombolytic therapy than in AMI patients with non-diabetes.[2] In recent years, a new strategy for AMI patients by primary percutaneous transluminal coronary angioplasty (P-PTCA), including intracoronary stenting has proven a more effective than intravenous thrombolytic therapy because of its rapid, complete and persistent patency of infarct-related artery (IRA). But, to date, there are very few reports on the results of mechanical reperfusion for AMI in patients with diabetes in the literature. Therefore, we describe baseline clinical and angiographic characteritics and evaluate the early and late clinical outcomes of diabetic patients with AMI treated by P-PTCA.

Methods

Patient Population

From January 1997 to April 2000, a total of 339 consecutive patients were seen at our hospital with AMI and suitable coronary anatomy for P-PTCA. The indications of P-PTCA were documented by the following:

(1) Persistent chest pain ≥30 minutes.
(2) ECG showing 1 mm ST segment elevation in 2 contiguous limb leads or 2 mm ST segment elevation in 2 contiguous precordial leads.
(3) Within 12 hours from onset of symptoms.

If the patients met the above criterias, they were prescribed aspirin and ticlopidine immediately, and written informed consent was obtained before they underwent primary PTCA in the catheterization laboratory.

According to the patients' history of treatment for diabetes, AMI patients were divided into 2 groups diabetes group including 63 cases (male:40 cases and female: 23 cases) and non-diabetes group including 276 cases (male: 233 cases and female: 43 cases).

Emergency Angiography and Primary PTCA

AMI patients were sent directly to catheterization laboratory from Emergency Department. P-PTCA with or without intracoronary stenting was performed according to the characteristics of coronary artery disease. Generally, we usually only intervented with IRA during emergency procedure.

Follow-up

Patients were followed up within 1 month for incidence of non-fatal heart failure and cardiac mortality and they were followed up again from 1 to 42 months (during a mean 20.6±8.7 months) for the major cardiac events (MACE) which included recurrence of angina, non-fatal heart failure, non-fatal myocardial infarction, need for target vessel revascularization (TVR), and cardiac death after hospital discharge.

Statistical Analysis

Continuous variables are expressed as mean±ISD; discrete variables are expressed as percentages. Differences between 2 groups were evaluated with the Student's t test or x^2 test. The Cox proportional hazard analysis was carried out to investigate the association between diabetes and the MACE, and the results are presented as relative risk (RR) with their respective 95% confidence intervals (95%CI).

Results

Baseline Clinical Characteristics (Table 1)

AMI patients with diabetes were more often female, and their values of left ventricular ejection fraction (LVEF) was significantly lower when compared to non-diabetes group ($P<0.05$).

Angiographic Characteristics (Table 2)

The results of angiographic characteristics in coronary arteries showed no significant differences between the 2 groups.

Table 1. Baseline clinical characteristics

Baseline factors	Diabetics (n=63)	Non-diabetic (n=276)
Age (years)	62.9±9.7	61.7±9.3
Female	23 (36.5%)*	43 (15.5%)
Hypertension	24 (41.3%)	94 (34.1%)
Hyperlipidemia	27 (42.9%)	99 (35.9%)
Cigarette smoking	24 (38.1%)	123 (44.6%)
Duration from onset of symptom to balloon (hours)	4.3±2.5	4.1±2.6
Infarct location		
Anterior	27 (42.9%)	130 (47.1%)
Inferior or/and posterior	31 (49.2%)	114 (41.3%)
Right ventricular	4 (6.3%)	24 (8.7%)
Others	1 (1.6%)	8 (2.9%)
Killip class II-IV	17 (27.0%)	61 (22.1%)
Peak value of CK (U/L)	2396±1804	2269±1873
Peak value of CK-MB (U/L)	97±76	92±69
LVEF	0.54±0.10*	0.60±1.13

*P<0.05, patients with versus without diabetes.

Table 2. Angiographic characteristics

Characteristics	Diabetics (n=63)	Non-diabetics (n=276)
Single vessel disease	24 (38.1%)	121 (43.8%)
Double vessel disease	19 (30.2%)	81 (29.4%)
Triple vessel disease	20 (31.8%)	74 (26.8%)
Left main disease	7 (11.1%)	14 (5.1%)
Infarcted-related artery (IRA)		
LAD	24 (38.0%)	129 (46.7%)
LCX	11 (17.5%)	38 (13.8%)
RCA	26 (41.3%)	105 (38.0%)
Left main	2 (3.2%)	4 (1.5%)
Double vessel occlusion	8 (12.7%)	14 (5.1%)
Triple vessel occlusion	1 (1.6%)	2 (0.7%)

LAD indicates left anterior descending; LCX, left circumflex; RCA, right coronary artery.

The Changes of MACE at the Early and Late Follow-up in AMI Patients with and without Diabetes (Table 3)

Stent was implanted in 95.24% and 88.77% of diabetic and non-diabetic patients respectively (P>0.05). Out of 339 patients, 54 diabetic patients and 254 non-diabetic patients were seen in the outpatient clinic for an interview or by telephone. The changes of MACE at the early and late follow-up are shown in Table 3.

Multivariate analysis indicated diabetes and the value of LVEF were associated with incidence of MACE and they were independent risk factors respectively affecting MACE free survival, among which diabetes was found to be the strongest predictor for (RR 4.15, 95% CI:1.29-15.62).

Discussion

This report describes the baseline clinical and angiographic characteristics in AMI patients with and without diabetes, and no differences in angiographic characteristics was found between the 2 groups which was consistent with Pajunen's report.[3] However, the

Table 3. The changes of MACE at the early and late follow-up

Events	Diabetics (n=54)	Non-diabetics (n=254)
Early follow-up		
Non-fatal heart failure	9 (16.7%)*	18 (7.1%)
Cardiac death	3 (5.6%)	5 (2.0%)
Late follow-up		
Recurrence of angina	15 (27.8%)	55 (21.7%)
Non-fatal myocardial infarction	2 (3.7%)	1 (0.4%)
Non-fatal heart failure	6 (11.1%)*	4 (1.6%)
Target vessel revascularization	11 (20.4%)**	16 (6.3%)
Cardiac death	1 (1.9%)	5 (2.0%)
Total cardiac death	4 (7.4%)	10 (3.9%)
Incidence of MACE	34 (63.0%)**	83 (32.7%)
MACE free survival rate	20 (37.0%)**	171 (67.3%)

*P<0.05, ** P<0.01, patients with versus without diabetes.

value of LVEF was lower in AMI patients with than those without diabetes.

Although intravenous thrombolytic therapy decreased the mortality rate in AMI patients with diabetes than conservative treatment, the clinical prognosis of these patients remained poor.[4] We tested whether mechanical reperfusion, such as P-PTCA or intracoronary stenting can lower the incidence of MACE due to its rapid, persistent and effective recanalization of IRA and restoration of TIMI 3 flow.

This study described the effects of P-PTCA on the clinical prognosis in AMI patients with diabetes, which showed the incidence of non-fatal heart failure at early or late follow-up was higher in diabetes group than in non-diabetes group, implying that the improvement of cardiac function in diabetics was not as good as in non-diabetics. It was reported that late vessel occlusion in diabetic patients might be associated with an increase in left ventricular end distolic volumes and a decrease in left ventricular function.[5] In the study, the preliminary result showed the percentage of need of TVR was higher in diabetes than non-diabetes, suggesting diabetes factor may accelerate the progression of restenosis in TVR, which might be related to advanced glycosylation in diabetic patients.[6] It had been reported that the incidence of in-stent restenosis in diabetic patients was higher than in non-diabetic patients,[7] but in our study, the result didn't show actual changes of restenosis rate at TVR because of the limited number of cases followed up by coronary artery angiography. At late follow-up (mean 20.6±8.7 months), no significant differences were observed in recurrence of angina, incidence of non-fatal myocardial infarction, and the early, late or total cardiac mortality rates between the 2 groups. Our results differed from previous studies that showed the early and late incidence of non-fatal myocardial infarction and cardiac death were higher in diabetes than non-diabetes group treated by balloon angioplasty.[8,9] Furthermore, previous studies have shown that the mortality rate increased within 30 days and still higher at 1 year follow up in AMI patients with diabetes than those without treated by intravenous thrombolysis.[2,4] We observed similar mortality rate in diabetic patients treated with P-PTCA compared with non-diabetic patients, suggesting that P-PTCA might be a more effective therapy that thrombolysis in this patient group. The present study indicated cardiac mortality rates within 1 month in AMI patients with and without diabetes who underwent P-PTCA were lower than those reported for intravenous thrombolysis.[10] But, compared with non-diabetes group, diabetes group had a higher incidence of the MACE and a lower MACE free survival rate, implying their overall clinical outcomes were poorer.

Multivariate analysis indicated diabetes and the value of LVEF were associated with incidence of MACE and they were independent risk factors respectively affecting MACE free survival rate. This findings were in accordance with that found by Silva et al,[11] in which primary intracoronary stenting significantly decreased the incidence of MACE in AMI patients with diabetes than those without diabetes.

In conclusions: MACE free survival rate is lower in AMI patients with diabetes treated by P-PTCA than those without diabetes, but overall cardiac mortality rates are similar in the 2 groups. These results suggest that P-PTCA may be more likely to improve the clinical benefit in terms of mortality rate, particularly in diabetes, compared with previous reports using thrombolytic therapy.

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